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Establishing Ergonomics in Industrially Developing Countries

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ABSTRACT: The introduction of ergonomics is an ongoing effort in industrially developing countries and will ultimately require an organized, programmatic approach spanning several countries and organizations. Our preliminary efforts with our partner countries of Viet Nam, Thailand, and Nicaragua have demonstrated that a one-time course is just the first step in a series of necessary events to provide skills and create an infrastructure that will have lasting impact for the host country. To facilitate that any sort of training has a lasting impact, it is recommended that host countries establish a "contract" with class participants and the guest instructors for at least one follow-up visit so instructors can see the progress and support the participants in current and future efforts. With repeated exchanges, the class participants can become the "in country experts" and the next generation of ergonomic trainers. Additionally, providing participants with an easy to use hazard assessment tool and methods for evaluating the financial impact of the project (cost/benefit analysis) will assist increase the likelihood of success and establish a foundation for future projects. In the future, developing trade and regionally/culturally specific "ergonomics toolkits" can help promote broader implementation, especially where training resources may be limited.

1 INTRODUCTION

With approximately 40% of the world's occupational and work-related health costs attributed to musculoskeletal diseases (Takala, 1999) a reduction in the occurrence of musculoskeletal disorders (MSDs) is essential to the improvement of occupational health in both industrialized (developed) countries (DCs) and industrially developing countries (IDCs). To date, efforts to introduce ergonomics programs within IDCs have focused primarily on large-scale industries. A programmatic process that is low cost, easy to understand, and sensitive to the social, cultural, and political considerations of each targeted country is needed. However, we feel the programmatic process by itself is not sufficient. Providing IDCs with the ability to analyze the cost-benefit impact will be essential for justification purposes, laying the foundation for future projects and ensuring program sustainability.

Toward the goal of sustainability of ergonomic programs, IDCs should seek to establish a permanent ergonomic infrastructure capable of providing training, disseminating information, following projects through to completion and evaluating economic impact. We believe this approach would be best achieved through a multi-country and multi-organizational approach.

As part of an attempt to provide our partner IDCs with an ergonomic infrastructure, the International Scholars in Occupational and Environmental Health, a Fogarty Institute funded training program at the University of Washington supported our training project. We prepared and presented ergonomics training courses in 3 IDCs: Vietnam, Thailand and Nicaragua. The purpose of this paper is to describe our experiences and lessons learned after providing training sessions to these three different Industrially Developing Countries.

2 METHODS

2.1 *Forming relationships with key partners in IDCs*

Partners in Vietnam, Thailand and Nicaragua played a key role in the genesis of the training courses. The National Institute of Occupational and Environmental Health (NIOEH) in Hanoi, Vietnam, Burhapa University in Thailand and the University of Nicaragua in Leon, Nicaragua (UNAN) were our partners in this effort. The participants in each course included medical professionals, engineers, university instructors, attorneys and safety and health representatives from local industries. Very few participants had previous ergonomics training and everyone had an interest in gaining a "working knowledge" of ergonomics.

2.2 *Preparation for Courses*

Vietnam: The NIOEH in Hanoi Vietnam requested a basic course to be taught at the Institute during a 4 day period aimed at an audience with little or no previous ergonomics experience. Since communication was difficult given the geographical, time and language differences, it became apparent that we would

need to design the course based primarily on our own ideas of what the participants would need. Understanding that most participants would have had little or no previous ergonomics experience, so we designed the course to begin with the basics and build into practical application of the principles. Our course design began by introducing work related musculoskeletal disorders (WMSDs,) and the concept of reducing risks through designing work to fit human capabilities and limitations. We then covered basic material on: 1) Anthropometry, 2) Biomechanics, 3) Tools for Upper Extremity Hazard Identification, 4) Tools for Manual Materials Handling Hazard Identification, 5) Office Ergonomics, 6) Implementing an Ergonomics Process – What Works and What Does Not, and 7) Standards and Guidelines.

To facilitate instilling a working knowledge of the principles, we attempted to include a "hands-on" case study with each topic to allow the students learn by doing.

Before beginning the course, we asked our hosts to arrange a site visit to provide the students with a real-life opportunity for application of their newly acquired ergonomics hazard assessment tools. This was done in order to provide students with the opportunity to evaluate risks and developing potential controls under the supervision of the faculty. On the third day of the course we visited a garment factory located about an hour from the Institute. We had asked the students to take notes on what they considered the higher risk tasks that they would like to evaluate. The instructors took digital photos for later use in class. On the fourth day, each group worked on hazard assessment and solution development for a task that they had chosen. As a final part of the project, each group presented their findings and recommendations to the larger group in the afternoon session. This proved to be a valuable part of the course by allowing each participant to apply their newly acquired knowledge in a practical manner.

Thailand: Burhapa University and the University of Washington Department of Environmental and Occupational Health Sciences have a well developed relationship. When our colleagues at Burhapa University learned that we would be teaching the course in Vietnam and would be passing through Bangkok en route to Hanoi, they requested that we teach a one day course at their campus. We condensed our materials for the Vietnam course into a 1- day overview and presented it to a group of 25 participants representing faculty, health and safety personnel from local enterprises and local medical practitioners.

Nicaragua: Our partner in Nicaragua (UNAN Leon) requested a course similar to the previously discussed Vietnam course but wanted a five day training course. Our hosts anticipated 40 - 45 students and provided a translator. Two instructors taught in Spanish and one in English with a translator. Due to the large class size, we requested that our hosts arrange for 3 separate site visits for the students to apply their new skills. The site visits were varied and interesting. One group of students visited a banana plantation, another went to a meat cutting/processing plant and the third saw a maquilladora manufacturing automobile parts. This variety provided a wide cross section of ergonomic challenges. Manual material handling and repetitive upper extremity activity in the banana plantation presented many challenges. The meat processing plant had repetitive upper extremity tasks and some manual material handling issues and the maquilladora had numerous high repetition, awkward upper extremity tasks.

3 RESULTS

Vietnam: We were lacking in sufficient knowledge in many areas on our first outing to Vietnam. Since our Industrial/Occupational Hygiene counterparts also provided a training course during the same time and had been to Viet Nam before, they had a much better working knowledge of the work environments and the various occupational hazards. Our firs major lesson in retrospect was that we would have been much better off/prepared had we been able to have one of the instructors visit the host country in advance in order to identify a potential course project and become familiar with current working environments and occupational hazards. Our second major lesson was the importance of identifying the correct amount of material to present. We were forewarned by our colleagues at NIOSH to scale back the amount of material covered due to the time needed for serial translation. Despite much of our material being translated in advance, we were only able to present one-third to one-half of the prepared material. The rough rule of thumb we derived from this experience is to plan to teach and cover material at 33% - 50% of the speed normally used in ones native language.

One aspect that cannot be taken for granted, is the skill of translators. We were fortunate in that both of our translators were fluent in English and experienced in the field of ergonomics, making the translation of concepts, not just words, much more effective and accurate.

Our third lesson was of the need to better anticipate and understand cultural differences and traditions. Our hosts included, as is traditional, a opening and closing ceremony for the workshops and scheduled in the typical two hour lunch breaks taken in Viet Nam. Our lack of cultural competency led to us failing to anticipate the time occupied by these events. This added to our need to compress and adapt the course as we went along.

Thailand: Our goal with the one day overview was to generate interest in pursuing an in-depth "train the trainer" course. Our feeling was that one day was too short to convey topics a meaningful fashion.

Nicaragua: The overall response to our course in Nicaragua was very positive. However, like Vietnam, the students described a lack of confidence in applying the principles on their own.

4 DISCUSSION

4.1 *Additional Lessons Learned*

Our experiences in three IDCs have provided several "lessons learned" that we will apply to future efforts. In the future, we plan to take more of a train-the-trainer (TTT) approach to allow the participants to become instructors and facilitators in participatory ergonomics activities. Addressing the social, psychological, and cultural needs of a given working population has been an important aspect of a participatory ergonomics approach.

In addition to the lessons outlined in the results, other lessons learned include the following: (1) To better understand and anticipate cultural differences and needs, a visit to the host country prior to the course is essential. Instructors should meet with the hosts and determine desired outcomes for the course, plan curricula and identify a site for the class to visit as part of a "hands on" project. This initial visit should include discussions of proposed/accepted procedures and how the hosts and instructors will work together create a successful effort. (2) Identify along with the hosts companies who are willing to commit to not only hosting a site visits, but entertain opportunities for improvements, and follow-up visits. (3) A 4 – 5 day course is just the first step in a series of necessary events to provide skills and create an infrastructure that will have lasting impact for the host country. The participating and host countries should establish "contract" with class participants for a return visit to see their progress and support their efforts, including more training. (4) As part of (3), regular communication should be available between students and instructors following the course when difficulties or questions arise. For example, following our initial course, participants in both Vietnam and Nicaragua expressed a lack of confidence in taking on projects on their own without expert guidance available to them. (5) Emphasis on the importance of the economics of ergonomics should be an integral part of any course. IDCs are under similar economic demands as DCs, and if there is one area that can be readily rectified, it is to better prepare IDCs to better handle the economic side of getting proposed changes justified, approved and implemented. Providing students with the ability to determine costs and benefits of controls and interventions is becoming mandatory in today's global economy. (6) As part of (3), a follow-up visit to the host country 6 – 12 months after the course to check on the progress of the project and provide guidance for next steps is an important step and is an integral part for the IDCs to develop their own "in country" experts. (7) As part of (4) and (6), have the instructors work with and involve students as trainers in their projects to educate workers to promote participatory ergonomics. Participatory principles, like those proposed in the train-the-trainer process, are an essential part of the collaborative, multidisciplinary approach necessary to reduce occupational health diseases (Stubbs, 2000).

4.2 *Conclusions*

In conclusion, the challenges to bring ergonomics to IDCs are substantial and cannot be successfully carried out by one country or one organization. A coordinated, multi-country and multi-organizational approach is needed. For example, in the United States, the Fogarty Organization creates strategic collaborations between US universities and various IDCs. This is one example of how affiliations could be used as a means to coordinate training opportunities. In the future, developing trade and regionally/culturally specific "ergonomics toolkits" will promote broader implementation and program success, especially where training resources are limited.

5 REFERENCES

Stubbs, D. A. (2000) Ergonomics and occupational medicine: future challenges. *Occupational Medicine* **50**(4), 277-282.

Takala, J. (1999) Introductory report of the International Labour Office, International Occupational Safety and Health Information Centre, Geneva, International Labour Office, p. 10.